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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/518,825	12/21/2004	Peter Klaus Bachmann	DE020166US	3595

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EXAMINER

WOLDEKIDAN, HIBRET ASNAKE

ART UNIT	PAPER NUMBER
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2613

MAIL DATE	DELIVERY MODE
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01/05/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/518,825

Applicant(s)

BACHMANN ET AL.

Examiner

Hibret A. Woldekidan

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period **will** apply and **will** expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply **will**, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 October 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 January 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Response to Arguments

1. Examiner acknowledges receipt of Applicant's Amendments, remarks, arguments received on 10/23/2008. Claims 1,3,5-12,16,18 have been amended and Claims 22,23 have been added. Applicant's arguments have been fully considered but they are not persuasive.

Applicant's argument:

1. Applicant argued on page 10 paragraph 3: "...that Brennan does not disclose or suggest "an optical signal processing device" nor "an optical signal processing component..."
2. Applicant argued on page 11 paragraph 2: "...Brennan in view of Franklin do not teach ... "wherein the source of electromagnetic radiation, the at least one photoluminescent carbon nanotube and the detector are together configured to perform an optical signal processing operation of the optical signal processing device" as recited in claim 1.."

Examiner's Answer:

1. Regarding the applicant's argument: "...that Brennan does not disclose or suggest "an optical signal processing device" nor "an optical signal processing component..." is not persuasive.

Examiner respectfully responds that any device that involve in transmitting or receive optical signals can be considered as an optical signal processing component or

device because a transmitter or receiver transforms a signal from one form to another via processing. As explained in Brennan(See page 56,57) the photoluminescence carbon nanotube can be considers as an optical signal processing component or device.

2. Regarding the applicant's argument: "...Brennan in view of Franklin do not teach ... "wherein the source of electromagnetic radiation, the at least one photoluminescent carbon nanotube and the detector are together configured to perform an optical signal processing operation of the optical signal processing device" as recited in claim 1.." is moot in light of the new ground of rejection. This limitation is rendered by Brennan in view of Dai.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

1. Claims 16, 17 are rejected under 35 U.S.C. 102(a) as being anticipated by Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant"

Considering Claim 16, Brennan teaches an optical device comprising at least one photoluminescent carbon nanotube configured to emit, in response to an input of electromagnetic radiation, light over a range that includes wavelengths from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the photoluminescent**

carbon nanotube emits light over the range 600-700 nm.), wherein an intensity of emitted light reaches a highest maximum at a wavelength greater than or equal to 600 nm and less than or equal to 700 nm(See Page 59 section 3.1, Paragraph 2 , fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm which is at a wavelength range of 600-700 nm).

Considering Claim 17, Brennen teaches the optical device of Claim 16 wherein the wavelengths vary non-linearly with intensity of the electromagnetic radiation (**See page 57section 1.5, Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the photoluminescent carbon nanotube intensity vary non-linearly with the intensity of the electromagnetic radiation).**

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,13-15,22 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Dai et al. (US 2004/0147037).

Considering claim 1 Brennan discloses electromagnetic radiation with a variable intensity(**See abstract page 56, Section 1.4 Page 57, fig. 2 i.e. fig. 2 illustrates that**

electromagnetic radiation with variable intensity), an optical component(See Section 1.1 page 56, i.e. carbon nanotube is an optical component), the optical component comprising at least one photoluminescent carbon nanotube configured to emit light at wavelengths varying non-linearly with the intensity of said light (See Section 1.4, page 57, fig. 2 i.e. the optical component is photoluminescence carbon nanotube that has a non linearly varying intensity), and a detector of electromagnetic radiation(See abstract, page 57 paragraph 5 i.e. absorbance of nonlinear photoluminescence in carbon nanotubes),

Brennan does not explicitly disclose wherein the source of electromagnetic radiation, the at least one photoluminescent carbon nanotube and the detector are together configured to perform an optical signal processing operation of the optical signal processing device.

Dai teaches a source of electromagnetic radiation(**630 of fig. 6**), the at least one photoluminescent carbon nanotube(**630 of fig. 6**) and a detector(**640 of fig. 6**) are together configured to perform an optical signal processing operation of the optical signal processing device(**See Paragraph 35,42, fig. 6**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have a source of electromagnetic radiation, at least one photoluminescent carbon nanotube and a detector to be configured together to perform an optical signal processing operation of the optical signal processing device, as taught by Dai, thus providing an efficient signal

processing device by using a sensing device that is adopted to sense differently characterized incoming data, as discussed by Dai **(See paragraph 6)**.

Considering Claim 13, Brennen discloses the optical signal processing device of claim 1, wherein the at least one photoluminescent carbon nanotube emits light at wavelengths over the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates photoluminescent carbon nanotube emits light at wavelengths over the range of wavelength range of 600-700 nm)**.

Considering Claim 14, Brennen discloses the optical signal processing device of claim 13, wherein the wavelength varying non-linearly with the intensity of said light reaches a highest maximum at a wavelength in the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that the wavelength vary non linearly with the intensity and the photoluminescent carbon nanotube the intensity reaches a maximum over the range of wavelength range of 600-700 nm)**.

Considering Claim 15, Brennen discloses the optical signal processing device of claim 14, wherein the wavelength varying non-linearly with the intensity of said light reaches a maximum at a wavelength in the range from 600 to 690 nm **(See Page 59 section 3.1, Paragraph 2 , fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm which is at a wavelength range of 600-700 nm)**.

Considering Claim 22 Dai teaches the optical signal processing device of claim 1, wherein the optical signal processing operation comprises one of an optical switching operation, an optical amplification operation, an

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optical limiting operation and an optical logical operation(See Paragraph 42, fig. 6 i.e. **the optical processing operation(600) perform a logic operation using a computer(670)).**

2. Claims 2-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Dai et al. (US 2004/0147037) further in view of Frankel (6,096,496).

Considering claim 2 Brennan and Dai disclose the optical signal processing device of claim 1, wherein the optical component comprises a substrate(See Dai: Paragraph 35,fig. 6 i.e. **optical signal processing component(600) having a substrate(605))**

Brennan and Dai do not explicitly disclose the optical signal processing device of claim 1, wherein the optical component comprises a substrate and a layer having a number of photoluminescent structure

Frankel teaches an optical component comprises a substrate and a layer having a number of photoluminescent structure (See Col. 17 line 53-67, Col. 26 line 7-28 i.e. **a Laser comprising a substrate and a photoluminescent emitting structure).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have an optical component to comprise a substrate and a layer having a number of photoluminescent structure, as

taught by Frankel, thus providing a device that transmits by distinctly emitting a variable intensity of light, as discussed by Frankel **(See Col. 5 lines 35-38)**.

Considering claim 3, Frankel teaches the optical signal processing device of claim 2, wherein the non-linear optical component further comprises an intermediate layer between the substrate and the layer having a number of photoluminescent structure **(See Col. 26 line 7-27 and line 44-55, Fig. 15, Fig 16 i.e. a wave guide between the substrate and a layer having a photoluminescent structure)**.

Considering claim 4, Frankel teaches an optical signal processing device of claim 1, wherein the electromagnetic radiation is monochromatic coherent laser light **(See Col. 19 lines 35-50, Col. 32 line 41-51 i.e. monochromatic coherent laser light which is a single wave length)**.

2. Claims 5,10-12,21,23 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Frankel (6,096,496)

Considering claim 5 Brennen discloses an optical signal processing component having at least one photoluminescent carbon nanotube having wavelengths varying non-linearly with the intensity of said light**(See abstract, page 57section 1.5, Page 59 section 3.1, fig. 2 i.e. non linear variation of wavelength versus intensity of photoluminescence carbon nanotubes)**, wherein the at least one photoluminescent carbon nanotube is configured to perform an optical signal processing operation **(See**

abstract, Section 1.1 page 56, page 57 paragraph 5) the photoluminescence carbon nanotube for processing optical signals).

Brennen does not explicitly show an optical signal processing device equipped with a source of electromagnetic radiation.

Frankel teaches an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity **(See Col. 15 line 40-44, Col. 34 line 60-67 i.e. Electromagnetic light source or laser emitting electromagnetic radiation with a variable intensity).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and show an optical signal processing device equipped with a source of electromagnetic radiation of variable intensity, as taught by Frankel, thus providing a device that transmits by distinctly emitting a variable intensity of light, as discussed by Frankel **(See Col. 5 lines 35-38).**

Considering Claim 10, Brennen discloses the optical signal processing component of claim 5, wherein the at least one photoluminescent carbon nanotube emits light at wavelengths over the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 2 i.e. fig. 2 illustrates that photoluminescent carbon nanotube emitting light over the wavelength range of 600-700 nm).**

Considering Claim 11, Brennen discloses the optical signal processing component of claim 10, wherein the wavelength varying non-linearly with the intensity of said light reaches a highest maximum at a wavelength in the range from 600 to 700 nm **(See Page 59 section 3.1, fig. 1 i.e. fig. 1 illustrates that photoluminescent carbon**

nanotube reaches a maximum intensity over the range of wavelength range of 600-800 nm).

Considering Claim 12, Brennen discloses the optical signal processing component of claim 11, wherein the wavelength varying non-linearly with the intensity of said light reaches the highest maximum at a wavelength in the range from 660 to 690 nm **(See Page 59 section 3.1, Paragraph 2, fig. 2 i.e. the intensity or energy of the emitted light reaches a maximum or peak at 660 nm).**

Considering Claim 21, Frankel teaches the optical device of claim 16, wherein the electromagnetic radiation is monochromatic coherent laser light **(See Col. 19 lines 35-50, Col. 32 line 41-51 i.e. monochromatic coherent laser light which is a single wave length).**

Considering Claim 23 Frankel teaches the optical signal processing component of claim 5, wherein the optical signal processing operation comprises one of an optical switching operation, an optical amplification operation, an optical limiting operation and an optical logical operation**(See Col. 15 lines 62-67, fig. 2 i.e. a sequencing control section(230) for perform a logic operation).**

3. Claims 6-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over BRENNAN ME. ET.AL; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Frankel (6,096,496) further in view of Lieber (7,129,554).

Considering claim 6, Brennen and Franke do not specifically disclose the optical signal processing component of claim 5, wherein the carbon nanotube has a thin film coating

Lieber teaches the optical component of claim 5, wherein the carbon nanotube has a thin film coating **(See Col. 5 line 54-57 i.e. the carbon nanotube has a thin film coating)**.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen and Franke, and modify the carbon nanotube to have a thin film coating, as taught by Lieber, thus providing efficient transport of charge carrier and excitations, as discussed by Lieber **(Col. 1 lines 21-25)**.

Considering claim 7, Lieber teaches the optical signal processing component of claim 5, wherein the carbon nanotube is embedded in a non-oxidizing matrix **(See Col. 11 line 6-38 i.e. buffer gas as a non-oxidizing matrix)**.

Considering claim 8, Lieber teaches the optical signal processing component of claim 5, wherein the carbon nanotube is embedded in a non-oxidizing matrix, which is transparent for electromagnetic radiation **(See Col. 16 line 15-20, Col. 25 line 38-43, Col. 11 line 6-38 i.e. glass which is non-oxidizing and transparent material)**.

Considering claim 9, Lieber teaches the optical component signal processing of claim 5, wherein the carbon nanotube is embedded in a non-oxidizing, flexible matrix **(See Col. 16 line 15-20, Col. 25 line 38-43, Col. 11 line 6-38 i.e. glass which is non-oxidizing and transparent material i.e. buffer gas as a non-oxidizing matrix)**.

4. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Bogner et al. (6,649,946).

Claim 18 Brennen does not specifically disclose the optical device of Claim 16 wherein the intensity of emitted light only decreases after the highest maximum intensity.

Bogner teaches the optical device of Claim 16 wherein the intensity of emitted light only decreases after the highest maximum intensity (**See fig. 5, Col. 4 lines 13-17, i.e. illustrates that the maximum intensity reaches between 600 and 700 nm and the intensity of emitted light decreases only after it reaches a maximum**).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have the intensity of emitted light only decreases after the maximum intensity, as taught by Bogner, thus providing a stabilized light emitting device that operates in high temperature for emitting a high color radiation, as discussed by Bogner (**Col. 2 lines 10-15**).

5. Claims 19,20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brennan ME et al.; Nonlinear Photoluminescence from Multiwalled Carbon Nanotubes; vol. 4461 ; pages 56-64; August 2001; USA. "Submitted on IDS by the applicant" in view of Lee et al. (6,514,113).

Considering Claim 19, Brennen discloses a photoluminescent carbon nanotube(**See abstract**).

Brennen does not explicitly show the optical device of claim 16, wherein the at least one photoluminescent carbon nanotube is comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube.

Lee teaches the optical device of claim 16, wherein the at least one photoluminescent carbon nanotube is comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube **(See Col. 4 line 20-35, Fig. 1 i.e. fig. 1 illustrates that carbon nanotubes comprised in a component including a substrate (element 100) comprising a number of carbon nanotubes (element 400)).**

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Brennen, and have the photoluminescent carbon nanotube to be comprised in a component including a substrate and a layer on the substrate comprising the at least one photoluminescent carbon nanotube, as taught by Lee, thus providing a means of producing an efficient light source, as discussed by Lee **(See Col. 1 lines 32-35).**

Considering Claim 20, Lee teaches the optical device of claim 19, wherein the component further comprises an intermediate layer between the substrate and the layer comprising the at least one photoluminescent carbon nanotube **(See Col. 4 line 4-35, Fig. 1 i.e. fig. 1 illustrates that an intermediate layer(element 200,300) between the substrate(element 100) and carbon nano-tubes (element 400)).**

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to HIBRET A. WOLDEKIDAN whose telephone number is (571)270-5145. The examiner can normally be reached on Monday to Friday from 8:00 a.m. - 4:00 p.m..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Vanderpuye can be reached on 5712723078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. A. W./
Examiner, Art Unit 2613

/Kenneth N Vanderpuye/
Supervisory Patent Examiner, Art Unit 2613